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117.0008
Merriam 3

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Merriam

Serial No.: 09/695,645

Filed: October 24, 2000

For: APPARATUS AND METHOD FOR MULTI-CHANNEL RECEIVER FRONT END

Group: 2611

Examiner: Pathak, Sudhanshu C.

Durham, North Carolina
November 13, 2007

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATION OF FACSIMILE TRANSMISSION

Sirs:

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office, Fax. No. 571-273-8300 on the date set forth below

1. Transmittal of Appellant's Brief (2 pages)
2. PTO-2038 Credit Card Payment Form (1 page)
3. Appeal Brief (34 pages)

The PTO did not receive the following listed item(s) PTO - 2038

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Signature

Date: November 13, 2007

117.0008
Merriam 3

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	:	Merriam
For	:	Apparatus and Method for Multi-Channel Receiver Front End
Serial No.	:	09/695,645
Filed	:	10/24/2000
Group	:	2611
Examiner	:	Pathak, Sudhanshu C.

Durham, North Carolina
November 13, 2007

MAIL STOP APPEAL BRIEF – PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPELLANT'S BRIEF

Dear Sirs:

1. Transmitted herewith is the APPEAL BRIEF in this application with respect to the Notice of Appeal filed on September 10, 2007.

2. The Applicant is other than a small entity.

3. Pursuant to 37 CFR 1.17(f) the fee for filing the Appeal Brief is $510.00.

[x] The Commissioner is hereby authorized to charge the fee of $510 our credit card.

[ ] The Commissioner is hereby authorized to charge the 1 month extension fee of $120 to our credit card. This letter petitions for a one month extension of time.

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[X] The Commissioner is hereby authorized to charge any additional fees which may be required or credit any overpayment to Law Offices of Peter H. Priest Deposit Account No. 50-1058.

Respectfully submitted,

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November 13, 2007

MAIL STOP APPEAL BRIEF – PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANT'S BRIEF

Sir:

1. The Real Party In Interest

The real party in interest is the assignee, LSI Corporation.

2. Related Appeals and Interferences

None.

3. Status of the Claims

This is an appeal from the June 12, 2007 final rejection of claims 1-28, all of the pending claims. Claims 1, 4-6, 11, 12, 15-17, 21, 22, and 25-28 were rejected under 35 U.S.C. § 103(a) based on Krasner et al. U.S. Patent No. 6,298,098 (Krasner) in view of applicant admitted prior art (AAPA). Claims 2, 3, 13, 14, 20, 23, and 24 were rejected under 35 U.S.C. § 103(a) based on Krasner in view of AAPA and further in view of Wilson et al. U.S. Patent Application Publication No. 2001/0051512 (Wilson). Claims 7-10, 18, and 19 were rejected under 35 U.S.C. § 103(a) based on Krasner in view of AAPA and further in view of Tourtier et al. U.S. Patent No. 5,446,495 (Tourtier). Pending claims 1-28 are the subject of this appeal.

4. Status of Amendments

The claims stand as last amended on August 31, 2006. No Amendment After-Final has been filed.

5. Summary of Claimed Subject Matter

The present invention relates generally to a receiver front end for use in a communications system that employs digitally modulated signals operating in an upstream band of frequencies that is divided into two or more non-overlapping upstream channels. The receiver front end accepts a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band. The data stream represents the entire band of frequencies. For example, with an upstream band of frequencies of 5 to 42 MHz, a data stream of 102.4 MHz may be used to represent the entire band of frequencies. The receiver front end is suitably equipped to receive the data stream and down-convert and decimate the data stream into the two or more non-overlapping channels. Figs. 1-13 and the text at page 7 et seq. provide a detailed description of the invention.

Claim 1

More particularly, claim 1 addresses a receiver front end for "use in a communications system that employs digitally modulated signals operating in an upstream band of frequencies that is divided into two or more non-overlapping upstream channels, each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference." As discussed at page 7, lines 11-28, a communication system 100 shows a front end processor 108 receiving digitally modulated signals, such as a data stream 112, operating in an upstream band of frequencies that is divided into two or more non-overlapping channels. A band of frequencies is illustrated in Fig. 2A that stretches from a lower frequency bound A to an upper frequency bound B as described at page 8, lines 6-9. The frequency band of Fig. 2A is divided into two or more non-overlapping channels as shown in Fig. 2B and described at page 8, lines 9-11. Figs. 2C and 2D illustrate non-overlapping upstream channels with "each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference" such as interference at 7MHz as shown in Fig. 2D and described at page 8, lines 11-19, for example. The receiver front end may be adapted for used in conjunction with various embodiments of the present invention.

The receiver front end of claim 1 comprises a "down-converter configured to accept a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band and utilizing the selected frequencies to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband, the down-converter shifting the said non-overlapping channels to a common baseline center frequency and producing a down-converted output signal for each

of the said non-overlapping channels." As described at page 10, line 16 – page 11, line 12 and illustrated in Fig. 5, a down-converter, such as converter 500, accepts a data stream 112 that is comprised of samples of the upstream band of frequencies, such as may be produced by a single analog to digital converter. The analog to digital converter samples the upstream band of frequencies comprised of two or more non-overlapping channels, with each channel occupying no more than a predetermined maximum frequency band. The upstream band of frequencies is sampled at a sampling rate of at least twice the frequency of the highest selected frequency within the band. The selected frequencies are used to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband. For example, a down-converter, such as converter 500 of Fig. 6, converts the component channels to baseband. The data stream, such as the 102.4 Mega samples per second is received in a down-converter, such as down converter 602, one of a plurality of "down converters 602, 604, and 606", each of which is dedicated to one of the N channels within the upstream band, as described at page 12, lines 1-10.

A down converter effects the conversion of its associated channel's data stream to a baseband signal. In particular, "Each down converter includes a multiplier that multiplies the input digital bit stream by $e^{j\omega_N n}$, where ω_N is the center frequency of a particular channel, to effect the conversion of each channels' data stream to a baseband signal, ... Each multiplier value is determined at the time channels are selected, as they might be to avoid interference" as described at page 12, lines 10-14, for example.

A down converted output signal is transferred from the down converter, such as down converter 602, 604, or 606, to the respective decimator, such as 608, 610, or 612. The baseband conversion and decimation may be performed in parallel, as illustrated in Fig. 6, or may be

performed in a more iterative fashion as is the case where the number of down converters and decimators is less than the number of channel required to be converted, as described at page 11, lines 1-12, for example.

The receiver front end of claim 1 also comprises a "decimator configured to decimate the down-converted output signals received from the down-converter" as illustrated in Fig. 5 and described at page 11, lines 1-6, for example.

Claim 2

Claim 2 addresses the "receiver front end of claim 1 wherein the down-converter comprises a plurality of down-converters selectively configured to down convert to baseband channel signals the two or more non-overlapping upstream channels centered on the selected frequencies within the upstream band of frequencies in parallel." For example, a down-converter, such as converter 500 of Fig. 6, converts a data stream, such as the 102.4 Mega samples per second data stream received in parallel in each of a plurality of "down converters 602, 604, and 606" as described at page 12, lines 1-10. Each of the down converters is selectively configured by use of a multiplier that multiplies the input digital bit stream by $e^{j\omega_N n}$, where ω_N is the center frequency of a particular channel, to effect the conversion of each channels' data stream to a baseband signal, as described, for example, at page 12, lines 10-14.

Claim 7

Claim 7 addresses the "receiver front end of claim 1 further comprising a plurality of down-converters arranged in a tree-structure to iteratively convert to baseband successively smaller portions of the upstream band of frequencies." Fig. 7 illustrates a receiver front end having a tree structure with "down conversion stages 702 through 726" that are used to iteratively convert to baseband successively smaller portions of the upstream band of

frequencies, as described at page 13, lines 17-24 and page 14, lines 5-16, for example.

Claim 11

Claim 11 addresses the "receiver front end of claim 1 further comprising an analog to digital converter (ADC) configured to receive the upstream band of frequencies as an analog signal, to sample the upstream band of frequencies at greater than twice highest frequency of the band and to provide the sampled data to the down-converter." Fig. 1 illustrates an ADC 106 having an output of 2Fmax data stream 112 is described at page 7, lines 20-28. Also, Fig. 5 illustrates a data stream 112 produced by a single ADC as described at page 10, lines 16-29, for example.

Claim 12

Claim 12 addresses a "method for down-converting and decimating digitally modulated signals operating in an upstream band of frequencies that is divided into two or more non-overlapping upstream channel signals, each of the upstream channel signals centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference." As discussed at page 7, lines 11-28, a communication system 100 shows a front end processor 108 receiving digitally modulated signals, such as a data stream 112, operating in an upstream band of frequencies that is divided into two or more non-overlapping channels. A band of frequencies is illustrated in Fig. 2A that stretches from a lower frequency bound A to an upper frequency bound B as described at page 8, lines 6-9. The frequency band of Fig. 2A is divided into two or more non-overlapping channels as shown in Fig. 2B and described at page 8, lines 9-11. Figs. 2C and 2D illustrate non-overlapping upstream channels with "each upstream channel centered on a selected frequency within the upstream

band of frequencies, wherein the selected frequencies are determined to avoid interference" such as interference at 7MHz as shown in Fig. 2D and described at page 8, lines 11-19. The front end processor 108 employing a method for down-converting and decimating the digitally modulated signals. The method for down-converting and decimating may be adapted for used in conjunction with various embodiments of the present invention.

The method of claim 12 comprises "accepting in a down-converter a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the upstream band." As described at page 10, line 16 – page 11, line 3 and illustrated in Fig. 5, a down-converter, such as converter 500, accepts a data stream 112 that that is comprised of samples of the upstream band of frequencies, such as may be produced by a single analog to digital converter. The analog to digital converter samples the upstream band of frequencies at a sampling rate of at least twice the frequency of the highest selected frequency within the band.

The method of claim 12 also comprises "converting in the down-converter each of the two or more non-overlapping upstream channel signals within the upstream band of frequencies to baseband channel signals utilizing the selected frequencies whereby each of the non-overlapping upstream channel signals is shifted to a same center frequency." As described at page 10, line 16 – page 11, line 12 and illustrated in Fig. 5, a down-converter, such as converter 500, accepts a data stream 112 that is comprised of samples of the upstream band of frequencies, such as may be produced by a single analog to digital converter. The analog to digital converter samples the upstream band of frequencies comprised of two or more non-overlapping channels within the upstream band of frequencies.

The selected frequencies are used to convert each of the two or more non-overlapping

channels within the upstream band of frequencies to baseband channel signals. For example, a down-converter, such as converter 500 of Fig. 6, converts the component channels to baseband. The data stream, such as the 102.4 Mega samples per second is received in a down-converter, such as down converter 602, one of a plurality of "down converters 602, 604, and 606", each of which is dedicated to one of the N channels within the upstream band, as described at page 12, lines 1-10. In particular, "Each down converter includes a multiplier that multiplies the input digital bit stream by $e^{j\omega_N n}$, where ω_N is the center frequency of a particular channel, to effect the conversion of each channels' data stream to a baseband signal, with the center frequency of the channel shifted to 0Hz. Each multiplier value is determined at the time channels are selected, as they might be to avoid interference" as described at page 12, lines 10-14, for example.

The baseband conversion of each of the two or more non-overlapping upstream channel signals may be performed in parallel, as illustrated in Fig. 6, or may be performed in a more iterative fashion as is the case where the number of down converters and decimators is less than the number of channel required to be converted, as described at page 11, lines 1-12, for example.

The method of claim 12 further comprises step "(C) decimating in a decimator the baseband channel signals received from the down-converter" as illustrated in Fig. 5 and described at page 11, lines 1-6, for example.

<u>Claim 13</u>

Claim 13 addresses the method of claim 12 wherein the step of converting further comprises "down-converting to baseband the two or more non-overlapping upstream channel signals within the upstream band of frequencies in a plurality of down-converters in parallel." For example, a down-converter, such as converter 500 of Fig. 6, is used for converting a data stream, such as the 102.4 Mega samples per second data stream received in parallel in each of a

plurality of "down converters 602, 604, and 606" as described at page 12, lines 1-10.

Claim 18

Claim 18 addresses the method of claim 12 wherein the step of converting further comprises "converting iteratively the two or more non-overlapping channel signals within the upstream band in a plurality of down-converters arranged in a tree-structure to successively smaller portions of the upstream band of frequencies." Fig. 7 illustrates a tree structure with "down conversion stages 702 through 726" that are used for iteratively converting to baseband successively smaller portions of the upstream band of frequencies, as described at page 13, lines 17-24 and page 14, lines 5-16, for example.

Claim 25

Claim 25 addresses a "receiver system that receives digitally modulated signals operating in an upstream band of frequencies divided into two or more non-overlapping upstream channels, each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference." As discussed at page 7, lines 11-28, a receiver system 104 shows an analog to digital converter (ADC) 106 and a front end processor 108 operating in an upstream band of frequencies such as transmitted by transmitter 102. The upstream band of frequencies are divided into two or more non-overlapping channels. For example, a band of frequencies is illustrated in Fig. 2A that stretches from a lower frequency bound A to an upper frequency bound B as described at page 8, lines 6-9. The frequency band of Fig. 2A is divided into two or more non-overlapping channels as shown in Fig. 2B and described at page 8, lines 9-11. Figs. 2C and 2D illustrate non-overlapping upstream channels with "each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference" such

as interference at 7MHz as shown in Fig. 2D and described at page 8, lines 11-19. The receiver system may be adapted for used in conjunction with various embodiments of the present invention.

The receiver system of claim 25 comprises an "analog to digital converter (ADC) receiving the digitally modulated signals and converting the digitally modulated signals into a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band." Fig. 1 illustrates an ADC 106 having an output of 2Fmax data stream 112 is described, for example, at page 7, lines 20-28. Also, Fig. 5 illustrates a data stream 112 produced by a single ADC as described at page 10, lines 16-29, for example. Further, as described at page 10, line 16 – page 11, line 12 and illustrated in Fig. 5, a down-converter, such as converter 500, accepts a data stream 112 that that is comprised of samples of the upstream band of frequencies, such as may be produced by a single analog to digital converter. The analog to digital converter samples the upstream band of frequencies comprised of two or more non-overlapping channels, with each channel occupying no more than a predetermined maximum frequency band. The upstream band of frequencies is sampled at a sampling rate of at least twice the frequency of the highest selected frequency within the band. For example, a band of frequencies is illustrated in Fig. 2A that stretches from a lower frequency bound A to an upper frequency bound B as described at page 8, lines 6-9. The frequency band of Fig. 2A is divided into two or more non-overlapping channels as shown in Fig. 2B and described at page 8, lines 9-11. Figs. 2C and 2D illustrate non-overlapping upstream channels with "each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference" such as interference at 7MHz as shown in Fig. 2D and described at page 8, lines 11-19, for example.

The receiver system of claim 25 also comprises "a receiver front end." As discussed at page 7, lines 18-28 a receiver system 104 includes a receiver front end, such as front end processor 108.

The receiver front end of claim 25 also comprises a "down-converter configured to accept the data stream and utilizing the selected frequencies to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband, the down-converter shifting the said non-overlapping channels to a common baseline center frequency and producing a down-converted output signal for each of the said non-overlapping channels." As described at page 10, line 16 – page 11, line 12 and illustrated in Fig. 5, a down-converter, such as converter 500, accepts a data stream 112 that that is comprised of samples of the upstream band of frequencies, such as may be produced by a single analog to digital converter. The selected frequencies are used to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband. For example, a down-converter, such as converter 500 of Fig. 6, converts the component channels to baseband. The data stream, such as the 102.4 Mega samples per second is received in a down-converter, such as down converter 602, one of a plurality of "down converters 602, 604, and 606", each of which is dedicated to one of the N channels within the upstream band, as described at page 12, lines 1-10.

A down converter effects the conversion of its associated channel's data stream to a baseband signal. In particular, "Each down converter includes a multiplier that multiplies the input digital bit stream by $e^{j\omega_N n}$, where ω_N is the center frequency of a particular channel, to effect the conversion of each channels' data stream to a baseband signal, ... Each multiplier value is determined at the time channels are selected, as they might be to avoid interference" as described at page 12, lines 10-14 for example.

A down converted output signal is produced from each of the down converter, such as down converter 602, 604, or 606, for each of the non-overlapping channels. The baseband conversion and decimation may be performed in parallel, as illustrated in Fig. 6, or may be performed in a more iterative fashion as is the case where the number of down converters and decimators is less than the number of channel required to be converted, as described at page 11, lines 1-12, for example.

The receiver front end of claim 25 further comprises a "decimator configured to decimate the down-converted output signals received from the down-converter and produce an output data stream" as illustrated in Fig. 5 and described at page 11, lines 1-6, for example.

<u>Claim 26</u>

Claim 26 addresses a "headend communication system." A headend 304 communication system is illustrated in Fig. 4 and addressed at page 9, lines 19-22, for example.

The headend communication system of claim 26 comprises a "plurality of mini-headends communicating with a headend, each mini-headend receiving a plurality of transmitted signals merged as digitally modulated signals in an upstream band of frequencies divided into two or more non-overlapping upstream channels, each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference." As shown in Fig. 4, mini-headends 400, 402, and 404 communicate with a headend 304 as described, for example, at page 9, lines 19-28. Each of the mini-headends 400, 402, and 404 contain a receiver system 104 for receiving a plurality of transmitted signals from subscribes 406. As shown in Fig. 1 and discussed at page 7, lines 11-28, the receiver system 104 uses an analog to digital converter (ADC) 106 and a front end processor 108 operating in an upstream band of frequencies. The upstream band of frequencies

are divided into two or more non-overlapping channels. For example, a band of frequencies is illustrated in Fig. 2A that stretches from a lower frequency bound A to an upper frequency bound B as described at page 8, lines 6-9. The frequency band of Fig. 2A is divided into two or more non-overlapping channels as shown in Fig. 2B and described at page 8, lines 9-11. Figs. 2C and 2D illustrate non-overlapping upstream channels with "each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference" such as interference at 7MHz as shown in Fig. 2D and described at page 8, lines 11-19, for example.

The headend communication system of claim 26 also comprises an "analog to digital converter (ADC) receiving the digitally modulated signals and converting the digitally modulated signals into a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band." Fig. 1 illustrates an ADC 106 having an output data stream 112 is described, for example, at page 7, lines 20-28. Also, Fig. 5 illustrates the data stream 112 such as may be produced by a single ADC as described at page 10, lines 16-29, for example. Further, as described at page 10, line 16 – page 11, line 12 and illustrated in Fig. 5, a down-converter, such as converter 500, accepts a data stream 112 that that is comprised of samples of the upstream band of frequencies, such as may be produced by a single analog to digital converter. The analog to digital converter samples the upstream band of frequencies comprised of two or more non-overlapping channels, with each channel occupying no more than a predetermined maximum frequency band. The upstream band of frequencies is sampled at a sampling rate of at least twice the frequency of the highest selected frequency within the band. For example, a band of frequencies is illustrated in Fig. 2A that stretches from a lower frequency bound A to an upper frequency bound B as described at page 8,

lines 6-9. The frequency band of Fig. 2A is divided into two or more non-overlapping channels as shown in Fig. 2B and described at page 8, lines 9-11. Figs. 2C and 2D illustrate non-overlapping upstream channels with "each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference" such as interference at 7MHz as shown in Fig. 2D and described at page 8, lines 11-19, for example.

The headend communication system of claim 26 comprises a "receiver front end." As discussed at page 7, lines 18-28 a receiver system 104 includes a receiver front end, such as front end processor 108.

The headend communication system of claim 26 also comprises a "down-converter configured to accept the data stream and utilizing the selected frequencies to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband, the down-converter shifting the said non-overlapping channels to a common baseline center frequency and producing a down-converted output signal for each of the said non-overlapping channels." As described at page 10, line 16 – page 11, line 12 and illustrated in Fig. 5, a down-converter, such as converter 500, accepts a data stream 112 that that is comprised of samples of the upstream band of frequencies, such as may be produced by a single analog to digital converter. The selected frequencies are used to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband. For example, a down-converter, such as converter 500 of Fig. 6, converts the component channels to baseband. The data stream, such as the 102.4 Mega samples per second is received in a down-converter, such as down converter 602, one of a plurality of "down converters 602, 604, and 606", each of which is dedicated to one of the N channels within the upstream band, as described at page 12, lines 1-10.

A down converter effects the conversion of its associated channel's data stream to a baseband signal. In particular, "Each down converter includes a multiplier that multiplies the input digital bit stream by $e^{j\omega_N n}$, where ω_N is the center frequency of a particular channel, to effect the conversion of each channels' data stream to a baseband signal, ... Each multiplier value is determined at the time channels are selected, as they might be to avoid interference" as described at page 12, lines 10-14, for example.

A down converted output signal is produced from each of the down converter, such as down converter 602, 604, or 606, for each of the non-overlapping channels. The baseband conversion and decimation may be performed in parallel, as illustrated in Fig. 6, or may be performed in a more iterative fashion as is the case where the number of down converters and decimators is less than the number of channel required to be converted, as described at page 11, lines 1-12, for example.

The headend communication system of claim 26 further comprises a "decimator configured to decimate the down-converted output signals received from the down-converter and produce an output data stream, wherein further processing phase corrects, time corrects, and equalizes the output data stream for all constituent channels." A decimator, such as decimator 502, is illustrated in Fig. 5 and described at page 11, lines 1-6, for example. As illustrated in Fig. 1, a backend processor or receiver 110 is configured to operate on output data stream 114 to phase correct, time correct, and equalize the data stream 114 for all the constituent channels as described at page 7, line 18 – page 8, line 5, for example.

6. Grounds of Rejection to be Reviewed on Appeal

Claims 1, 4-6, 11, 12, 15-17, 21, 22, and 25-28 were rejected under 35 U.S.C. § 103(a) based on Krasner in view of AAPA. Claims 2, 3, 13, 14, 20, 23, and 24 were rejected under 35 U.S.C. § 103(a) based on Krasner in view of AAPA and further in view of Wilson. Claims 7-10, 18, and 19 were rejected under 35 U.S.C. § 103(a) based on Krasner in view of AAPA and further in view of Tourtier.

7. Argument

The final rejection under 35 U.S.C. § 103 did not follow M.P.E.P. § 706.02(j) which states:

> After indicatin g that the rejection is under 35 U.S.C. 103, the Examiner should set forth...the difference or differences in the claim over the applied reference,...the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter, and ... an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification.

As will be illustrated below, the claims of the present invention are not obvious in view of the references relied upon by the Examiner.

A. Rejections under 35 U.S.C. § 103(a)

The art rejections are not supported by the relied upon art. 35 U.S.C. § 103 which governs obviousness indicates that "differences between the subject matter sought to be patented and the prior art" are to be assessed based upon "the subject matter as a whole". Analyzing the entirety of each claim, the rejections under 35 U.S.C. § 103 are not supported by the relied upon art as addressed further below. Only after an analysis of the individual references has been made can it then be considered whether it is fair to combine teachings. However, as addressed further below, fairness requires an analysis of failure of others, the lack of recognition of the problem,

and must avoid the improper hindsight reconstruction of the present invention. Such an analysis should consider whether the modifications are actually suggested by the references rather than assuming they are obvious. The 35 U.S.C. § 103 rejections made here pick and choose elements from two or more separate references, none of which presents any motivation for making the suggested combination. This approach constitutes impermissible hindsight and must be avoided. As required by 35 U.S.C. § 103, claims must be considered as a whole. When so considered, the present claims are not obvious.

Claims 1, 4-6, 11, 12, 15-17, 21, 22, and 25-28

Claims 1, 4-6, 11, 12, 15-17, 21, 22, and 25-28 were rejected under 35 U.S.C. § 103(a) based on Krasner in view of AAPA. The Official Action rejects claim 1 based on Krasner in view of the data over cable service interface specification (DOCSIS) standard.

Regarding DOCSIS, the DOCSIS standard describes requirements that must be met by a device to be in compliance with the standard. As correctly admitted by the Official Action in the Response to Arguments section, "....the DOCSIS standard does not describe the down-converter presently claimed in claims 1, 25, or 26 or the method of down-converting as claimed in claim 12." The Examiner relies upon Krasner to provide the limitation of the claimed down-converter.

Krasner describes a headend demodulator for acquiring and synchronizing a data burst by detecting a special format preamble. Time division multiple access (TDMA) time slots at a given frequency are assigned to subscribers with gaps between transmissions. A burst demodulator processes the incoming signal arriving between gaps at the given frequency with each burst processed individually. Krasner, Fig. 2 and col. 2, lines 47-58. The individual processing of a data burst includes a filter/down-converter/decimator 32 as a single channel operational unit that provides a single baseband signal. Krasner, Figs. 3 and 4A and col. 3 lines

57-63. **Krasner is silent concerning the structure and operation of the filter/down-converter/decimator 32 and is further silent about any adjustments that might be made to its operation. Krasner provides no motivation to change, modify, or in any way extend the capabilities of the filter/down-converter/decimator 32 so that it would operate in the manner presently claimed.**

The Official Action suggests that it would have been obvious as a result of the DOCSIS sub-channeling requirement to equip Krasner's demodulator to be compliant with the DOCSIS standard. Krasner provides no indication how such compliance may be achieved and the DOCSIS standard does not specify how to comply. Krasner's demodulator 16 of Fig. 3 and as shown in more detail in Figs. 4a and 4b employs only a single 10.752 MHz analog signal to be converted. As noted above, Krasner is silent concerning the structure and operation of the filter/downconverter/decimator 32 of the demodulator 16. It is also noted that the Official Action correctly admits that Krasner's "Fig. 3 shows only a single channel in detail as only an example." Krasner provides no indication how "two or more non-overlapping channels" may be down-converted as claimed in claims 1, 25, or 26 or the method of down-converting as claimed in claim 12 may be provided.

In order to hypothetically meet the DOCSIS standard with Krasner as a guide, one might speculate that the apparatus of Krasner's Fig. 3 could be duplicated and tuned for each additional channel to be demodulated. However, such an approach may have many problems as described in the background section of the present invention where "[u]pstream receivers typically devote a circuit board of electronics to each channel, and, within each circuit board, an analog to digital converter (ADC) to each channel. If any of those channels are unused, the associated ADC and ancillary circuitry [such as a down-converter for each channel] is, in effect, wasted." See, page

3, lines 3-6 of the present invention. DOCSIS provides no suggestion, reason or motivation to make specific modifications to an existing single channel implementation, such as Krasner's demodulator 16 or filter/downconverter/decimator 32. Further, if anything, Krasner's implementation for demodulation of a single channel, as illustrated in Figs. 3, 4a, and 4b, teaches away from the presently claimed invention since Krasner does not recognize the problem of down converting "two or more non-overlapping channels" as claimed. Emphasis added. Krasner does not teach and does not make obvious a down-converter as presently claimed in claims 1, 25, or 26 or the method of down-converting as claimed in claim 12. DOCSIS provides no basis for curing the deficiencies of Krasner.

Claim 11

Claim 11 claims "an analog to digital converter (ADC) configured to receive the upstream band of frequencies as an analog signal, to sample the upstream band of frequencies at greater than twice highest frequency of the band and to provide the sampled data to the down-converter." The "upstream band of frequencies" referred to in claim 11 and claimed in claim 1 contains "two or more non-overlapping upstream channels." Further, as claimed in claim 1, the data stream provided to the down-converter comprises "samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band." The selected frequencies are determined to avoid interference, such as interference at 7MHz as shown in Fig. 2D and described at page 8, lines 11-19, for example. As noted above, the Official Action correctly admits that Krasner's "Fig. 3 shows only a single channel in detail as only an example." Further, Krasner provides no discussion of "selected frequencies" as claimed in claim 1. DOCSIS provides no suggestion, reason or motivation to make specific modifications to an existing single channel implementation, such as Krasner's analog to digital

converter 30. As a result, neither Krasner nor DOCSIS teach or make obvious claim 11.

The dependent claims distinguish over the combined teachings of Krasner in view of DOCSIS by their dependence from their respective independent claims.

Rejection of claims 2, 3, 13, 14, 20, 23, and 24

Dependent claims 2, 3, 13, 14, 20, 23, and 24 were rejected under 35 U.S.C. § 103(a) based on Krasner in view of the DOCSIS standard and further in view of Wilson. As addressed above Krasner does not teach and does not make obvious a down-converter as presently claimed in claim 1 or the method of down-converting as claimed in claim 12.

Additionally, claim 2 addresses the "front end of claim 1 wherein the down-converter comprises a plurality of down-converters selectively configured to down convert to baseband channel signals the two or more non-overlapping upstream channels centered on the selected frequencies within the upstream band of frequencies in parallel." Claim 13 addresses the "method of claim 12 wherein the step (B) of converting further comprises the step of:
(B1) down-converting to baseband the two or more non-overlapping upstream channel signals within the upstream band of frequencies in a plurality of down-converters in parallel." Since claims 2, 3, and 23 and claims 13, 14, 20, and 24 depend from and contain all the limitations of base claims 1 and 12, respectively, claims 2, 3, 13, 14, 20, 23, and 24 distinguish from Krasner in the same manner as the base claims. In addition, the dependent claims address a number of combinations of limitations not found in the applied references.

Further, the Official Action correctly admits that Krasner in view of the admitted prior art does not disclose that a down-converter comprises a plurality of down-converters and decimators, wherein each decimator associated with a corresponding down converter, selectively configured to down convert to baseband channel signals the two or more non-overlapping

upstream channels centered on the selected frequencies within the upstream band of frequencies in parallel. The Official Action further relies on Wilson as purportedly resolving this admitted deficiency.

The Official Action cites Wilson's Fig. 4, elements "Down Converters (1-8)" and Fig. 5, elements 507 as a plurality of downconverters purportedly described as "selectively configured to down convert to baseband channel signals the two or more non-overlapping upstream channels centered on the selected frequencies within the upstream band of frequencies in parallel." However, Wilson does not provide such down-conversion capabilities. Each of Wilson's plurality of down-converters receives a separate input signal and produces a single output signal. Wilson, Fig. 4 and Fig. 5. In contrast to Wilson, a down-converter, as claimed in claim 1 of the present invention, is "configured to accept a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band". Further, as claimed in claim 1, the down-converter "producing a down-converted output signal for each of the said non-overlapping channel." For example, in Fig. 5 of the present invention, a single data stream 112 that comprises two or more non-overlapping channels is received by converter 500 that converts the two or more non-overlapping channels to baseband in parallel or iteratively producing CH1, CH2, ... CHN. See, for example, Fig. 5 and page 11, lines 1-7 of the present invention. Fig. 6 of the present invention shows a parallel configuration of down-converters, as described at page 12, lines 1-14, for example. Wilson does not cure the deficiencies of Krasner.

Rejection of Claims 7-10, 18, and 19

Dependent claims 7-10, 18, and 19 were rejected under 35 U.S.C. § 103(a) based on Krasner in view of the DOCSIS standard as applied to claims 1 and 2 and further in view of

Tourtier. As addressed above Krasner does not teach and does not make obvious a down-converter as presently claimed in claim 1 or the method of down-converting as claimed in claim 12.

Additionally, claim 7 addresses the "receiver front end of claim 1 further comprising a plurality of down-converters arranged in a tree-structure to iteratively convert to baseband successively smaller portions of the upstream band of frequencies." Claim 18 addresses the "method of claim 12 wherein the step (B) of converting further comprises the step of: (B2) converting iteratively the two or more non-overlapping channel signals within the upstream band in a plurality of down-converters arranged in a tree-structure to successively smaller portions of the upstream band of frequencies." Since claims 7-10 and claims 18 and 19 depend from and contain all the limitations of base claims 1 and 12, respectively, claims 7-10 and claims 18 and 19 distinguish from Krasner in the same manner as the base claims. In addition, the dependent claims address a number of combinations of limitations not found in the applied references.

Further, the Official Action correctly admits that Krasner in view of the admitted prior art does not disclose that a down-converter comprises a plurality of down-converters and decimators, wherein each decimator associated with a corresponding down converter, selectively configured to down convert to baseband channel signals the two or more non-overlapping upstream channels centered on the selected frequencies within the upstream band of frequencies in parallel. The Official Action further relies on Tourtier as purportedly resolving this admitted deficiency.

The Official Action cites Tourtier's Fig. 7 as having a tree-structure to convert and decimate the channels in the frequency band repeatedly to the baseband for quantization circuits 28 (col. 7, lines 20-30). However, Tourtier's Fig. 7 is a three level coder/decoder for the

processing of video signals appropriate for three levels of video standards. Tourtier, col. 7, lines 17-19, and lines 53-56. Tourtier's Fig. 7 three level coder/decoder is not "configured to accept a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band and utilizing the selected frequencies to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband, the down-converter shifting the said non-overlapping channels to a common baseline center frequency and producing a down-converted output signal for each of the said non-overlapping channels" as claimed in claim 1. In contrast to Tourtier, a down-converter, as claimed in claim 1 of the present invention, is "configured to accept a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band". For example, in Fig. 5 of the present invention, a single data stream 112 that comprises two or more non-overlapping channels is received by converter 500 that converts the two or more non-overlapping channels to baseband in parallel or iteratively producing CH1, CH2, ... CHN. See, for example, Fig. 5 and page 11, lines 1-7 of the present invention. Further, the tree down converter decimator (TDD) 700 of Fig. 7 of the present invention accepts at the digital input 754 a "digital input stream of real data sampled at twice the frequency of the highest frequency of the group channel which comprises N channels being down-converted and decimated" as described at page 14, lines 5-16, for example. Tourtier does not cure the deficiencies of Krasner.

To sum up, Krasner, Wilson, and Tourtier do not show and do not suggest a receiver front end, a receiver system, a headend communication system, or a method of down-converting and decimating as presently claimed. Nothing in the cited references indicates a recognition of the problems addressed by the present invention. Further, nothing in the cited references

indicates a system or method which would solve the problems addressed by the present invention. The claims of the present invention are not taught, are not inherent, and are not obvious in light of the art relied upon.

C. The Examiner's Findings of Obviousness are Also Contrary to Law of the Federal Circuit

As shown above, the invention claimed is not suggested by the relied upon prior art. The references cited by the Examiner, if anything, teach away from the present invention. It is only in hindsight, after seeing the claimed invention, that the Examiner could combine the references as the Examiner has done. This approach is improper under the law of the Federal Circuit, which has stated that "[w]hen prior art references require selective combination by the Court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself." Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 U.S.P.Q. 2d 1434, 1438 (Fed. Cir. 1988), cert. den., 109 S. Ct. 75, 102 L.Ed. 2d 51 (1988); quoting Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1132, 227 U.S.P.Q. 543, 535 (Fed. Cir. 1985). Furthermore, "[i]t is impermissible to use the claims as a frame and the prior art references as a mosaic to piece together a facsimile of the claimed invention." Uniroyal, 837 F.2d at 1051, 5 U.S.P.Q. 2d at 1438.

In In re Laskowski, 871 F.2d 115, 10 U.S.P.Q. 2d 1397, the Federal Circuit reversed an obviousness rejection of the claims in an application for a bandsaw. The claimed bandsaw used a pulley type wheel loosely fitted with a tire. The primary reference showed a similar bandsaw where the band was tightly fitted. The Federal Circuit stated that the prior art did not provide a suggestion, reason or motivation to make the modification of the reference proposed by the Commissioner. Id. at 1398. The Court added that "there must be some logical reason apparent

from the positive, concrete evidence of record which justifies a combination of primary and secondary references." Id. quoting In re Regel, 526 F.2d 1399, 1403, 188 U.S.P.Q. 136, 139 (C.C.P.A. 1975), citing In re Stemniski, 444 F.2d 581, 170 U.S.P.Q. 343 (C.C.P.A. 1971).

In Uniroyal Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 5 U.S.P.Q. 2d 1434 (Fed. Cir. 1988), cert. den., 109 S. Ct. 75, 102 L.Ed. 2d 51 (1988), the Federal Circuit reversed the District Court's finding that the claims for a patent for an air flow deflecting shield were obvious. Without any suggestion in the art, the District Court improperly chose features from several prior art references to recreate the claimed invention.

The Examiner's rejection suggests that the Examiner did not consider and appreciate the claims as a whole. The claims disclose a unique combination with many features and advantages not shown in the art. It appears that the Examiner has oversimplified the claims and then searched the prior art for the constituent parts. Even with the claims as a guide, however, the Examiner did not recreate the claimed invention.

8. Conclusion

The rejection of claims 1-28 should be reversed and the application promptly allowed.

Respectfully submitted,

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CLAIMS APPENDIX
(Claims Under Appeal)

1. A receiver front end for use in a communications system that employs digitally modulated signals operating in an upstream band of frequencies that is divided into two or more non-overlapping upstream channels, each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference, the receiver front end comprising:

a down-converter configured to accept a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band and utilizing the selected frequencies to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband, the down-converter shifting the said non-overlapping channels to a common baseline center frequency and producing a down-converted output signal for each of the said non-overlapping channels; and

a decimator configured to decimate the down-converted output signals received from the down-converter.

2. The receiver front end of claim 1 wherein the down-converter comprises a plurality of down-converters selectively configured to down convert to baseband channel signals the two or more non-overlapping upstream channels centered on the selected frequencies within the upstream band of frequencies in parallel.

3. The receiver front end of claim 2 further comprising a plurality of decimators, each decimator associated with a corresponding down converter, each decimator configured to receive one of the baseband channel signals from a corresponding one of the down-converters and to decimate the received baseband channel signal to a digital data stream having two samples

for each symbol period of the received baseband channel signal.

4. The receiver front end of claim 1 wherein the communications system is a data over cable service interface specifications (DOCSIS) compatible communications system.

5. The receiver front end of claim 1 wherein the receiver front end is configured to down-convert and decimate a DOCSIS data stream comprising digitally modulated signals that fall within non-overlapping upstream channels that are assigned within a 5 to 42 MHz band.

6. The receiver front end of claim 1 wherein the receiver front end is configured to down-convert and decimate a data stream in which non-overlapping channels are assigned bandwidths of approximately 3.2MHz, 1.6 MHz, .8 MHz, .4MHz, or .2 MHz.

7. The receiver front end of claim 1 further comprising a plurality of down-converters arranged in a tree-structure to iteratively convert to baseband successively smaller portions of the upstream band of frequencies.

8. The receiver front end of claim 7 wherein the down-converters are configured to iteratively convert to baseband smaller portions of the upstream band of frequencies until each channel within the band is converted to baseband.

9. The receiver front end of claim 8 further comprising decimators configured to decimate the successively smaller portions of the upstream band of frequencies.

10. The receiver front end of claim 9 wherein the decimators are configured to decimate each baseband channel to a sample rate that is twice the symbol rate of the baseband channel.

11. The receiver front end of claim 1 further comprising an analog to digital converter (ADC) configured to receive the upstream band of frequencies as an analog signal, to sample the

upstream band of frequencies at greater than twice highest frequency of the band and to provide the sampled data to the down-converter.

12. A method for down-converting and decimating digitally modulated signals operating in an upstream band of frequencies that is divided into two or more non-overlapping upstream channel signals, each of the upstream channel signals centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference, the method comprising the steps of:

(A) accepting in a down-converter a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the upstream band;

(B) converting in the down-converter each of the two or more non-overlapping upstream channel signals within the upstream band of frequencies to baseband channel signals utilizing the selected frequencies whereby each of the non-overlapping upstream channel signals is shifted to a same center frequency; and

(C) decimating in a decimator the baseband channel signals received from the down-converter.

13. The method of claim 12 wherein the step (B) of converting further comprises the step of:

(B1) down-converting to baseband the two or more non-overlapping upstream channel signals within the upstream band of frequencies in a plurality of down-converters in parallel.

14. The method of claim 12 wherein the step (C) of decimating further comprising the step of:

(C1) receiving in a decimator one of the baseband channel signals from a corresponding

one of the down-converters, decimating the received baseband channel signal to a digital data stream having two samples for each symbol period of the received baseband channel.

15. The method of claim 12 wherein the data stream is a DOCSIS compatible data stream.

16. The method of claim 12 wherein the data stream is a DOCSIS data stream comprising digitally modulated signals that fall within non-overlapping upstream channels that are assigned within a 5 to 42 MHz band.

17. The receiver front end of claim 12 wherein the data stream is a data stream in which non-overlapping channels are assigned bandwidths of approximately 3.2MHz, 1.6 MHz, .8 MHz, .4 MHz, or .2 MHz.

18. The method of claim 12 wherein the step (B) of converting further comprises the step of:

(B2) converting iteratively the two or more non-overlapping channel signals within the upstream band in a plurality of down-converters arranged in a tree-structure to successively smaller portions of the upstream band of frequencies.

19. The method of claim 18 wherein the step (B2) further comprises the step of:

(B3) converting iteratively to the smaller portions of the upstream band of frequencies until each channel within the band is converted to baseband whereby each of the two or more non-overlapping channel signals is shifted to a same center frequency.

20. The method of claim 12 further comprising the step of:

(C2) decimating in decimators successively smaller portions of the upstream band of frequencies.

21. The method of claim 12 further comprising the step of:

(C3) decimating in decimators each of the baseband channel signals to an ample rate that is twice the symbol rate of each of the baseband channel signals being decimated.

22. The method of claim 13 further comprising the step of:

(D) receiving the upstream band of frequencies as an analog signal in one or more analog to digital converters (ADCs) , the number of ADCs being fewer than the number of channels in the upstream band of frequencies,

(E) sampling the upstream band of frequencies in the ADCs at greater than twice highest frequency of the band; and

(F) providing the sampled analog signal to the down-converters by the one or more ADCs.

23. The receiver front end of claim 1 wherein the baseline center frequency is zero Hz.

24. The method of claim 12 wherein the same center frequency is zero Hz.

25. A receiver system that receives digitally modulated signals operating in an upstream band of frequencies divided into two or more non-overlapping upstream channels, each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference, the receiver system comprising:

an analog to digital converter (ADC) receiving the digitally modulated signals and converting the digitally modulated signals into a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band; and

a receiver front end comprising:

a down-converter configured to accept the data stream and utilizing the selected frequencies to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband, the down-converter shifting the said non-overlapping channels to a common baseline center frequency and producing a down-converted output signal for each of the said non-overlapping channels; and

a decimator configured to decimate the down-converted output signals received from the down-converter and produce an output data stream.

26. A headend communication system comprising:

a plurality of mini-headends communicating with a headend, each mini-headend receiving a plurality of transmitted signals merged as digitally modulated signals in an upstream band of frequencies divided into two or more non-overlapping upstream channels, each upstream channel centered on a selected frequency within the upstream band of frequencies, wherein the selected frequencies are determined to avoid interference, at least one mini-headend comprising:

an analog to digital converter (ADC) receiving the digitally modulated signals and converting the digitally modulated signals into a data stream comprising samples of the upstream band of frequencies sampled at a rate of at least twice the frequency of the highest selected frequency in the band; and

a receiver front end comprising:

a down-converter configured to accept the data stream and utilizing the selected frequencies to convert each of the two or more non-overlapping channels within the upstream band of frequencies to baseband, the down-converter shifting the said non-overlapping channels to a common baseline center frequency and producing a down-converted output signal for each

of the said non-overlapping channels; and

a decimator configured to decimate the down-converted output signals received from the down-converter and produce an output data stream, wherein further processing phase corrects, time corrects, and equalizes the output data stream for all constituent channels.

27. The headend communication system of claim 26 wherein the communicating with a headend is over an optical fiber.

28. The headend communication system of claim 26 is part of a cable television system and wherein the plurality of transmitted signals are from subscribers of the cable television system.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.